

NOTES ON COLORADO ENTOMOSTRACA

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The entomostracan fauna of Colorado, although of great economic importance as the chief source of food supply for the fishes of the state, has hitherto received but little attention. The early explorers noted a single species which they found in great numbers in temporary pools of rain water on the plains to the east of the mountains, and the naturalists connected with the geological surveys during the '70s found several species in the elevated mountain lakes and one species on the western slope. For more than half a century no addition has been made to the entomostracan fauna of the great plains of eastern Colorado.

From the geographical position occupied by the state, in the midst of the great arid region, it might be inferred that entomostracan life, dependent as it is upon the presence of a body of water for its very existence, would be but poorly represented. The results obtained in the preliminary work which it is the purpose of this paper to record would indicate that it is abundant both in species and individuals.

That many species of Entomostraca are capable of producing eggs which may remain dormant through long periods of drouth, to be afterwards awakened into activity upon being supplied with water in sufficient quantity for their development, is a fact which has been frequently demonstrated. This may be true of most, if not all, of the forms commonly found in fresh waters. Their rapid development and great fecundity under favorable conditions of environment make it possible for their life cycle to be completed and a new supply of eggs to be deposited in a temporary pool, which may be dried up in the course of a few days or a few weeks at most. When it is remembered that the arid region is subject to occasional rainstorms of great violence, locally known as "cloud-bursts," and that the snows of winter, scanty though they be, may furnish sufficient water to fill the small depressions in the plains,

and also that, owing to the aridity of the climate and the consequent lack of stream erosion, such depressions as are capable of holding water are to be found in great numbers on the plateaus of the arid region, it will be readily perceived that conditions favorable to the development of the Entomostraca are not wanting.

HISTORICAL

The earliest reference to Entomostraca in what is now the state of Colorado appears in the report of Long's expedition, in which James (23)¹ notes the occurrence of a species of *Apus*, which he calls *A. obtusus*, in "rain-water puddles on the Platte river near the Rocky mountains." Unfortunately, his description is so meager that the species is not recognizable. Packard (74a) thought it "probably the same" as Le Conte's *A. longicaudatus*.

Twenty-three years later, Le Conte (46) described *Apus longicaudatus*, which, he says, was "found in immense numbers in a small shallow lake on the high plateau between Lodge Pole creek and Crow creek, northeast of Longs Peak."

Nearly thirty years after Le Conte, Carpenter (74) noted the occurrence of *Daphnia pulex* in a pool above timber-line on Mt. Elbert, and Packard described (74) a lernaean (*Achtheres Carpenteri*) and (74a) a new branchiopod (*Branchinecta coloradensis*) from the mountains of Colorado. Three years later he described (Packard 77) another branchiopod (*Lepidurus bilobatus*) from Po cañon, and Chambers (77) recorded the occurrence of two species of Cladocera (*Daphnia brevicauda* n. sp. and *Chydorus sphaericus*), and three new species of Ostracoda (*Cypris grandis*, *C. altissimus*, and *C. mons*), making eleven species of Entomostraca reported from Colorado up to the close of the year 1877, as follows:

Branchiopoda

<i>Apus obtusus</i> James.	<i>Lepidurus bilobatus</i> Packard.
<i>Apus longicaudatus</i> Le Conte.	<i>Branchinecta coloradensis</i> Packard.

Cladocera

<i>Chydorus sphaericus</i> O. F. Müller.	<i>Daphnia brevicauda</i> Chambers.
<i>Daphnia pulex</i> De Geer.	

Ostracoda

<i>Cypris grandis</i> Chambers.	<i>Cypris mons</i> Chambers.
<i>Cypris altissimus</i> Chambers.	

Copepoda

Achtheres Carpenteri Packard.

¹See list of works cited at the end of this paper.

Since 1877 no additions to the list appear to have been reported. Within the past year the writer has made a large number of collections of Entomostraca in the vicinity of Greeley, Col., and these collections, together with a few others made in former years in various parts of eastern Colorado, form the basis of the present paper.

BRANCHIOPODA

LIMNADIADAE

Eulimnadia texana Packard.

I found this species in a muddy pool in Crooked creek, Otero county, in June, 1882, where it occurred in great numbers together with the following species. It is also found in Texas and Kansas (Packard, 83).

Estheria mexicana Claus.

I collected about twenty individuals of this species from the same pool with the preceding. I found it again in August, 1897, in Little Crow creek, in Weld county. It has been reported from Mexico, New Mexico, Kansas, Lake Winnipeg, Ohio, and Kentucky (Packard 83).

APODIDAE

Apus Newberryi Packard.

Occurred abundantly in a pool in Little Crow creek in August, 1897, together with the preceding. This species has been found hitherto only in Utah; its occurrence on the eastern side of the mountains is a matter of interest, as it is the first instance in which the same species of crustacean has been found in both regions.

BRANCHIPODIDAE

Branchinecta Lindahli Packard.

I found a single specimen of this species, a female with eggs, in a temporary pool near Greeley, July 2, 1901, together with *Moina affinis*. Hitherto its only recorded habitat was Kansas (Packard 83).

Streptocephalus texanus Packard.

About thirty individuals of this species, including females with eggs and adult males, were collected by the writer from a rock pool

filled with water from melting snow, in April, 1882, on the north side of the Mesa de Mayo. It has been reported from Texas and Kansas (Packard 83).

CLADOCERA

DAPHNIADAE

Daphnia pulex De Geer.

Occurs in Seely lake; also occasionally in pools about Greeley.

Ceriodaphnia reticulata var. *dentata* Birge.

Abundant in Seely lake and in ponds around Greeley.

Scapholeberis mucronata (O. F. M.)

Of frequent occurrence in ponds near Greeley.

Simocephalus vetulus (O. F. M.).

Abundant around Greeley in all ponds.

Moina affinis Birge.

Often extremely abundant in pools formed by summer rains.

LYNCEIDAE

Alona glacialis Birge.

Occurs sparingly in ponds and in Seely lake.

Alonopsis latissima Kurz.

In ponds near Greeley. Not common.

Chydorus sphaericus (O. F. M.).

Occurs in the majority of my collections from the ponds about Greeley; also from Seely lake.

OSTRACODA

CYPRIDIDAE

Candona acuminata (Fischer).

I found this occurring in great numbers in March and April, in a small grassy pool near Greeley, which soon after became dry.

Cyclocypris lacvis (O. F. M.).

I have found this species in shallow ponds near Greeley in February and March.

Cypridopsis Newtoni Brady and Robertson.

Common in ponds near Greeley in June and July.

Cypridopsis vidua (O. F. M.).

Abundant during the summer in stagnant pools.

Cypris fuscata Jurine.

I have found a few individuals of this species in Carter's slough near Greeley.

Erpetocypris olivacea Brady and Norman.

Occurs in abundance in Carter's slough.

COPEPODA

CENTROPAGIDAE

Diaptomus sicilis Forbes.

Occurs in Seely lake, where it is the most abundant of the Entomostraca.

Diaptomus clavipes Schacht.

I found this species occurring in a pool of only a few feet area in a narrow ravine fed by springs. My specimens when alive were transparent and colorless excepting the distal portion of the antennae, which were blood red. The peculiar hook on the fifth foot of the male is represented in its correct position in Schacht's figure, but in his description it is erroneously placed upon the next segment.

CYCLOPIDAE

Cyclops insectus Forbes.

C. albidus Jurine.

C. ater Herrick.

C. serrulatus Fischer.

Excepting *C. ater*, which is apparently rare, these are abundant in the regions about Greeley.

HARPACTIDAE

Canthocamptus minutus (O. F. M.)

Length of female, 0.65–0.75 mm. Length of male, 0.60–0.65 mm.

My specimens were obtained from a small pond near the track of the C. & S. railroad in the city of Greeley.

LIST OF ENTOMOSTRACA KNOWN TO OCCUR IN THE STATE OF COLORADO

(An asterisk [*] placed before the name of a species indicates that it is new to the state.)

BRANCHIOPODA

Limnadiadae

- * *Eulimnadia texana* Packard. * *Estheria mexicana* Claus.

Apodidae

- Apus longicaudatus* Le Conte (? = * *Apus Newberryi* Packard.
obtusus James). *Lepidurus bilobatus* Packard.

Branchiopodidae

- Branchinecta coloradensis* Packard. * *Streptocephalus texanus* Packard.
* *Branchinecta Lindahli* Packard.

CLADOCERA

Daphniadae

- Daphnia pulex* De Geer. * *Scapholeberis mucronata* (O. F. Müller).
Daphnia brevicauda Chambers. * *Simocephalus vetulus* (O. F. Müller).
* *Ceriodaphnia reticulata* var. *dentata* Birge. * *Moina affinis* Birge.

Lynceidae

- * *Alona glacialis* Birge. *Chydorus sphaericus* (O. F. Müller).
* *Alonopsis latissima* Sars.

OSTRACODA

Cyprididae

- * *Candona acuminata* (Fischer). *Cypris altissimus* Chambers.
* *Cyclocypris laevis* (O. F. Müller). * *Cypris fuscata* Jurine.
Cypria mons (Chambers). *Cyprinotus grandis* (Chambers).
* *Cypridopsis Newtoni* Brady and * *Erpetocypris olivacea* Brady and
Robertson. Norman.
* *Cypridopsis vidua* (O. F. Müller).

COPEPODA

Centropagidae

- * *Diaptomus sicilis* Forbes. * *Diaptomus clavipes* Schacht.

Cyclopidae

- * *Cyclops insectus* Forbes. * *Cyclops ater* Herrick.
* *Cyclops albidus* Jurine. * *Cyclops serrulatus* Fischer.

Harpacticidae

- * *Canthocamptus minutus* (O. F. Müller).

Lernaeopodidae

- Achtheres Carpenteri* Packard.

SUMMARY

Branchiopoda	8 species, of which	5 are new to the state.
Cladocera	9 species, of which	6 are new to the state.
Ostracoda	9 species, of which	6 are new to the state.
Copepoda	8 species, of which	7 are new to the state.
Total,	34 species, of which	24 are new to the state.

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